THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY, DIVISION OF MYCOLOGY AND DISEASE SURVEY
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
AGRICULTURAL RESEARCH ADMINISTRATION
UNITED STATES DEPARTMENT OF AGRICULTURE

Volume XXIX January 1, 1945 Number 1

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

IN THIS ISSUE

Check list revision, by Freeman Weiss, page - 2.

Virus diseases are an important factor in sweet cherry growing in Utah, according to Arthur S. Rhoads, page - 6.

P. W. Miller reports on the incidence of diseases of walnut and filbert in Oregon in 1944, page - 20.

The prevalence of olive knot in California orchards is reported by Henry Schneider and E. W. Bodine, page - 21.

Shorter reports on diseases of fruit and nut crops, page - 22.

The number of dead and dying elms observed in Illinois was much greater in 1944 than for the past few years, according to J. C. Carter, page - 23.

Arthur S. Rhoads describes a giant witches'-broom of undetermined cause, occurring on native pines in Florida, page - 26.

Results of an asparagus rust survey in Delaware are reported by A. J. Mix, page - 28.

Symptoms characterizing the undetermined "yellow-top" of tomato reported from Texas are recorded by George E. Altstatt and S. S. Ivanoff, page - 29.

Lettuce diseases observed in greenhouses, page - 30.

Losses from sorghum diseases in Kansas are reported by C. M. Slagg, page - 31.

254493

LIBRARY
CURRENT SERIAL RECORD
FEB 26 1945
U. S. DEPARTMENT OF AGRICULTURE

CHECK LIST REVISION

Freeman Weiss

CAREX (CYPERACEAE)

CAREX spp., SEDGE. Grass-like perennial herbs of very numerous species occurring chiefly in moist habitats as marshes and stream banks, sometimes in open woods and uplands, of wide distribution in the Temperate and Arctic zones. Some are sod- or tussock-forming and are useful in soil building and erosion control. A few spp. afford grazing or are cut for hay for domestic animals in the northern Prairies and western Plains, some furnish food for wildlife, as elk and reindeer. Sedge hay is much used as packing material. Several spp. are used for ornament, especially for borders and ground cover, others are used in basketry. Because species identification of the hosts has often been doubtful or lacking, the records are not classified as to hosts except for a few specific annotations.

Amerosporium caricum (Lib.) Sacc., on leaves. Miss. Conidial stage of Niesslia exosporioides (Desm.) Wint.

Arthrinium caricicola G. Kunze & Schm. ex Fr., on leaves. Pa.

Cercospora caricina Ell. & Dearn., leafspot. On numerous Carex spp., Iowa, N. Y., Wis.

C. caricis Dearn. & House. On C. arctata Boott. and C. folliculata L., N. Y.

C. microstigma Sacc: On C. arctata, C. granularis Muhl. and C. laxiflora Lam., N. Y.

Cintractia caricis (Pers.) Magn., seed smut. General, on numerous Carex spp. Although American authors term this a "complex species" it has not been subdivided here, as in Europe, into more restricted groups differing in spore dimensions and in hosts.

C. externa (Griff.) Clint., seed smut. On C. filifolia Nutt. in Mont., Nebr., N. Dak., Wyo.

C. subinclusa (Koern.) Magn., seed smut. Occasional, on various Carex spp., mostly in the north and west.

Cintractina caricetorum Speg., seed smut. On C. pennsylvanica Lam., Pa.

Cladosporium caricicola Cda. (? C. graminum Cda.), on old leaves. General.

Clasterosporium caricinum Schw., on leaves. Ill., Ind., N. Y., Pa.

Clathrospora pentamera (Karst.) Berl., on dead leaves. Utah.

Claviceps sp., ergot. On C. tribuloides Wahl., Mich.

Colletotrichum graminicolum (Ces.) G. W. Wils. anthracnose. Wis.

Comandra umbellata (L.) Nutt., on roots. Eastern States.

Cryptomela caricis (Cda.) Sacc., on bracts and seeds. Wis.

(Cryptosporium nubilosum Ell. & Ev.): ? Pseudostegia nubilosa.

Darluca filum (Biv.-Bern.) Cast., epiparasite on Puccinia and Uromyces. Occasional.

Dinemasporium graminum Lév., on old leaves. N. J.

Dothidella caricina Dearn. & House, on leaves. N. Y.

567179

CAREX cont.

Entorrhiza ? caricicola Ferd. & Winge, rootgall. Minn.

Epichloë typhina (Pers. ex Fr.) Tul., on leaves. N. Y.

Farysia olivacea (Jaap) Hoehn., seed smut. On C. rostrata Stokes in Calif., Pa., Wash., Wis.; on C. turgescens Torr., Fla.

Helicosporium phragmites Hoehn., leaf spot. Me.

Helminthosporium sp., leaf spot.

Hysteropezizella diminuens (Karst.) Nannf., on culms and leaves, ? blight. Mich., N. Y., Alaska. Reported in the conidial stage (? Pseudostegia nubilosa) as parasitic. A number of records reported as spp. of Mollisiopsis, Naevia, Phacidium, Pyrenopeziza, Stegia, and Trochila belong here or in the following spp.

H. leporinae Nannf. On C. exsiccata Bailey in Colo., and C. siccata Dewey in N. Y.

H. multipuncta (Pk.) Nannf. On C. scoparia Schk. and C. stellulata Good., N. Y.

H. subvelata (Rehm) Hoehn. On Carex sp., Vt.

Leptosphaeria sp., on leaves and stems. Wis., Alaska.

L. folliculata Ell. & Ev. var. oxyspora J. J. Davis (? L. caricicola Fautr., ? L. caricina Schroet.), on dead parts of leaves. Wis.

Leptothyrella caricis Dearn. & Barth., on leaves. Kans.

Lophodermium caricinum (Rob. ex Desm.) Duby, on leaves and stems. Calif., Colo., N. Y.

Marasmius caricicola Kauffm., base of culms. Mich., N. Dak.

Mycosphaerella spp., on dead leaves and stems. Reported under several names without clear distinction as M. caricis (Dearn. & House) Petr. & Syd. on C. stricta Lam., N. Y.; M. lineolata (Rob. ex Desm.) Schroet. on C. rostrata Stokes, Colo.; M. recutita (Fr.) Johans. on C. varia Muhl. in N. Y., M. tassiana (DeN.) Johans. on Carex spp., Colo. and Alaska; M. wichuriana (Schroet.) Johans. on Carex sp. in Mont., Alaska

Neottiospora arenaria Syd., on dry leaves of C. rostrata Stokes in Wis.

Phaeoseptoria caricis Tehon & Daniels, on leaves. Ill.

Phleospora caricis Ell. & Ev. (? Stagonospora albescens J. J. Davis), on leaves. Del., N. Y. Wis.

Phyllachora caricis (Fr.) Sacc., tar spot. Ill., Me.

Phyllosticta caricicola Sacc. & Scalia, leaf spot. Alaska. P. caricicola (Brun.) Allesch. has priority.

P. caricis (Fckl.) Sacc., leaf spot. N. Y., Wis.

Pleospora discors (Mont.) Ces. & DeN., on dead leaves. Colo.

Pseudostegia nubilosa (Ell. & Ev.) Bub., on leaves. Ky., N.J., Mont. Conidial stage of Hysteropezizella diminuens?

*Puccinia atrofusca (Dudl. & Thomp.) Holw. (II, III), Carex-Artemisia rust. On numerous Carex spp. from Wis. to N. Mex., Calif. and Wash.; also in Alaska. O and I on Artemisia spp.

---

* It is impracticable to present the details of the host relationships in the Carex rusts here; North American Flora, the Seymour Host Index, or Arthur's Manual of Rusts should be consulted for them. The geographic range of each rust fungus is stated in conformance with Arthur; host plants of those having a limited host range as now known are specifically mentioned but for the more cosmopolitan species these details are omitted.

CAREX cont.

P. bolleyana Sacc. (II, III), Carex-elder rust. On numerous Carex spp. from Me. to Fla., Tex. and Wis. O and I on Sambucus canadensis L. and S. pubens Michx.

P. caricis (Schum.) Schroet. (II, III), Ribes-urtica rust, gooseberry rust. Throughout temperate N. America to the artic. A variable sp., consisting of 2 widely distributed principal vars. of cosmopolitan host range, and several minor ones of limited host range and distribution: var. grossulariata Arth. with O and I on numerous Grossularia and Ribes spp.; var. urticata (Kern) Arth. with O and I on Urtica spp.; both occurring on numerous Carex spp.; var. caricis-strictae (Diet.) Arth. on C. stricta L. and C. torta Boott. in Conn., Del., Mass., N. Y. and W. Va., O and I unknown in nature; var. uniporula (Orton) Arth., occurring on C. debilis Michx., C. gracillima Schw., C. pallescens L., C. virescens Muhl., etc., in the Northeastern States to Wis., with O and I on Grossularia spp.

P. caricis-shepherdiae J. J. Davis (II, III), Elaeagnus-Shepherdia rust. Northeastern States to Colo. and northward, chiefly on C. eburnea Boott. and C. viridula Michx., with O and I on Elaeagnus and Shepherdia.

P. extensicola Plowr. (II, III), Carex-composite rust, evening primrose rust, etc. A cosmopolitan sp. consisting of some 10 varieties differing in aecial hosts but uniform on numerous Carex spp. occurring throughout the U. S. and northward. The principal vars. are: var. asteris (Thuem.) Arth. on various Carex spp. in the northern U. S., with O and I on Aster, etc., spp.; var. erigerontis Arth. on various Carex spp. with O and I on Erigeron, etc.; var. solidaginis (Schw.) Arth. on various Carex spp. with O and I on Solidago, etc.; var. euthamii Arth. on C. scoparia Schk. with O and I on Euthamia spp.; var. hieraciata (Schw.) Arth. on various Carex spp., with O and I on Hieracium, Senecio, etc.; var. oenotherae (Mont.) Arth. on various Carex spp., with O and I on Chamaenerion and Oenothera spp.; var. hydnoidea (Berk. & Curt.) Arth. on C. pennsylvanica Lam., with O and I on Dirca palustris L. in the Eastern and Central States.

P. karelica Tranz. (II, III), Trientalis rust. On Carex canescens L., C. diandra Schk., C. paupercula Michx., and C. strictior Dewey, from Me. to Wis. and Alaska, with I on Trientalis americana Pursh.

P. limosae Magn. (II, III), Lysimachia rust. On C. limosa L., etc. in the Northeastern States to Nebr., with O and I on Lysimachia spp.

P. macrospora (Pk.) Arth. (II, III), Carex-Smilax rust. On C. comosa Boott. and C. vestita Willd. in Del. and N. J., with O and I on Smilax spp.

P. microsora Koern. (II, III). On Carex spp., sparsely distributed in Pa., Va., W. Va., Wis., also La. and Oreg. O and I unknown.

P. minuta Diet. (II, III). On C. verrucosa Muhl. in Ala. and Fla. O and I unknown.

P. minutissima Arth. (II, III), Decodon rust. On C. lasiocarpa Ehrh., N. Y. to Mich. and Mo. O and I on Decodon verticillatus (L.) Ell.

P. molocaiensis Cummins (II, III). On Carex sp. in Hawaii. O and I unknown

CAREX cont.

P. puritanica Cummins (II, III). On C. pennsylvanica Lam., Mass. Correlated in uredial stage with P. extensicola. O and I unknown.

Ramularia canadensis Ell. & Ev., leaf spot, Wis.

Schizonella melanogramma (DC.) Schroet., leaf smut. On many spp. throughout the Carex range.

S. pusila (Cke. & Pk.) Cif., leaf smut. On C. pennsylvanica Lam., Mass. to Colo. and Wis.

Scirrhia lineata Dearn. & House, on old leaves, N. Y. Also referred to Apiospora lineata Dearn. & House.

Sclerotinia caricis-ampullaceae Nyberg. On stems of C. rostrata Stokes in Wyo.

S. duriaeana (Tul.) Rehm, inflorescence blight and stem rot. On C. crinita Lam. and other spp. in N. Y. and Oreg. Only the form affine Whet. has been found in the U. S. and it probably occurs throughout the Carex range -- Whetzel.

S. longisclerotialis Whet., inflorescence blight and stem rot. On C. prairea Dewey and other spp. in Me. and N. Y.

S. paludosa Cash & Davidson. On leaves of C. exsiccata Bailey in Colo.

S. utriculorum Boud. On seeds of C. athrostachya Olney in Colo.

Septoria spp., leaf spot. Several spp. reported but not well discriminated, these include: S. baudysiana Sacc. on C. vesicaria L. in Wyo.; S. caricinella Sacc. & Roum. on various spp. in Colo., Wash., Wis., Wyo.; S. caricicola Sacc. on C. scoparia Schk. in Oreg. and C. tribuloides Wahl. in Mich.; S. lineolata Sacc. on C. pennsylvanica Lam. and other spp. in Calif., Md. and Oreg.; S. lunelliana Sacc. on C. athrostachya Olney in N. Dak.; S. polita J. J. Davis on C. stellulata Good. in Wis.; S. riparia Pass. on C. pennsylvanica in Colo., Miss. and Wis.; S. tenuis Dearn. & House on C. flexuosa Muhl. in N. Y.

Sphaerulina pallens J. J. Davis, on leaves. Wis.

Stagonospora albescens J. J. Davis (? Phleospora caricis Ell. & Ev.), on leaves of Carex spp., Wis.

S. caricinella Brun. On C. pennsylvanica and other spp., in Wis.

S. heleocharidis Trail var. caricina Sacc. & Scalia. On C. festiva Dewey, in Alaska.

S. strictae Ell. & Ev. On C. stricta Lam., in Kans.

S. tetramera J. J. Davis. On C. riparia W. Curtis, in Wis.

Synchytrium caricis Tracy & Earle, on leaves of C. pyrenaica Wahl. in Utah.

Thecaphora aterrima Tul., inflorescence smut. On C. adusta Boott., in Iowa; on C. pennsylvanica Lam. in Colo., Iowa and Kans.

Uromyces minutus Diet. (II, III). On Carex spp. from N. Y. to Fla., Tex. and Wis. Correlated with Puccinia caricis var. grossulariata. O and I unknown.

U. perigynius Halst. (II, III), Carex-Rudbeckia rust. On Carex spp. throughout the U. S. Correlated with Puccinia extensicola, with O and I on Rudbeckia spp. and other Compositae.

U. uniporulus Kern (II, III). On C. gracillima Schw. and C. flexuosa Muhl., in the eastern U. S. Correlated with Puccinia caricis var. uniporula; O and I unknown.

CAREX cont.

U. valens Kern (II, III). On C. lupulina Muhl. and C. rostrata Stokes, in Ind. & Wis. C & I unknown.

Volutella caricicola Miles, on leaves. Miss.

DIVISION OF MYCOLOGY AND DISEASE SURVEY

VIRUS AND VIRUS-LIKE DISEASES OF SWEET CHERRY IN UTAH, AND NOTES ON SOME CONDITIONS AFFECTING VARIOUS FRUIT CROPS

Arthur S. Rhoads

Fruit growing, particularly of cherries, peaches, apricots, apples, and pears, has long been an important industry in certain favored sections of Utah where sufficient water is available for irrigation. However, there has been a growing realization for a number of years that in many instances orchards were proving extremely short-lived and that certain diseases, particularly those of virus origin, were becoming increasingly widespread and rapidly taking an alarming toll. Despite the importance of its fruit-industry, however, it was not until within the last 5 years that the State expended any money for survey work, eradication, or research to safeguard it, and even the amount thus far expended has been very limited in comparison to the urgent need. As yet, with the exception of the widespread Western X-disease of peach and the more localized Peach Mosaic, but very little is known concerning the distribution and relative importance of fruit tree diseases in the State, while education of nurserymen concerning the danger of dissemination by using budwood from trees affected by various virus and virus-like diseases, as well as regulatory measures to prevent such dissemination, are still in a pioneer stage.

The progress that has been made in studying and evaluating the relative importance of various fruit tree diseases in Utah is due largely to the excellent work of Dr. B. L. Richards of the Utah Agricultural Experiment Station, who began an intensive study of these problems 5 years ago. Even as yet, however, only relatively little is known concerning a number of these diseases. In fact it was only last summer that the occurrence in the State of the Rusty Mottle disease of sweet cherry was definitely established. It was by reason of the imperative need for further information on the occurrence, distribution, and importance of diseases affecting stone fruits before control or eradicatory measures can be wisely formulated that the Emergency Plant Disease Prevention work was concentrated on diseases of these fruits, and particularly in sweet cherry orchards.

Diseases of Sweet Cherries in Northern Utah

A preliminary survey, with special reference to virus and virus-like diseases, was made in a large number of sweet cherry orchards in Weber, Davis, Salt Lake, and Utah Counties, where plantings are confined to well-drained gravelly to rocky soils along deltas in the mouths of canyons and on benches on the lower, western slopes of the Wasatch Mountains. Numerous orchards occur in Weber and Davis Counties and comparatively few in Salt Lake County, while most of the fruit grown in the State is produced in Utah County.

While growers in the first 3 counties almost invariably practice clean

cultivation, those in Utah County generally favor cover crops. Orchards are fertilized chiefly with varying amounts of animal manures. Very few growers use commercial fertilizers, though the trees respond greatly to their use. In many orchards the trees show relatively scanty new growth and general sparseness, pallor, and small-leaved condition of the foliage. Many growers obviously rely entirely too much upon the natural productivity of their soils and are in reality slowly but surely depleting them, especially where cover crops are not grown.

Irrigation usually is by only 2 or 3 water furrows down either side of the trees and usually very close to them. Where movement of water is not sufficiently retarded on slopes considerable washing of the soil occurs, with silting and filling in around trees in the lower situations. In some orchards irrigation is deferred until the trees develop a pronounced wilting, yellowing, and even shedding, of leaves. In a few instances serious injury and dying of large bearing trees has resulted from the lack of adequate irrigation facilities.

In many cherry orchards numerous trees show severe winter injury from extreme low temperatures that occurred a few years ago.

The productiveness of a large percentage of the orchards that have been examined could be increased greatly by setting out new trees in the places of missing, dead, or declining trees.

In this preliminary survey an effort was made to randomize as much as possible the orchards that were visited. Trees of mixed ages were found to occur in many orchards because of additions and replacements being made from time to time. In classifying the trees the replants were indicated as such only when obviously made comparatively recently. Thus the total number of replants in any one orchard or block is not necessarily a full index of the total number of trees that have been removed or replaced during its life. In most cases the replants were cherry trees but in others they comprised peaches, apricots, apples, and pears.

Rusty Mottle. What appeared to be this virus disease was first discovered in Utah by Dr. B. L. Richards in 1943. Buds taken from trees in 3 different orchards in Davis County were inoculated into healthy Royal Ann and Lambert cherries. One hundred percent of the trees inoculated developed specific symptoms of rusty mottle the following spring. A preliminary survey of the occurrence of this disease was made in a number of orchards in Davis County in 1943. However, no official report was made in regard to its occurrence.

In the present survey, rusty mottle, which appears to be localized chiefly in certain orchards, has been found to occur in Weber, Davis, Salt Lake, and Utah Counties. Prior to this survey, the disease was known to occur only in Davis County.

In Weber County the disease was found to occur in only 2 orchards out of 46 examined. In one case it occurred on 8 trees in a block of old, declining trees. In the other, typical cases occurred on 2 trees and suspected ones on 2 others in a small 3-year-old block, but did not occur on any of the older trees. In this case it was clearly apparent that the nursery from which the trees were bought was responsible for the dissemination of this disease. In Davis County rusty mottle was found occurring more or less frequently in 9 out of 27 orchards examined, and has proved quite destructive in 5 orchards in the vicinity of Kaysville. In this county it was observed on 224 out of 7159 bearing trees. In Salt Lake County rusty

mottle was found to occur in 2 out of 9 orchards examined. In one orchard it occurred on 18 trees, including a few replants, and has proved rather serious on about a dozen large trees. In the other orchard only mild cases were noted on 2 trees. In Utah County rusty mottle was found to occur in 9 out of 18 orchards examined, occurring on 303 trees out of a total of about 8000, including replants. The orchards where this disease has been found thus far in Utah County occur at Orem, Provo Canyon, Spring Creek Canyon east of Springville, and Mapleton.

In some Utah County orchards occurrence of rusty mottle was limited to young trees 4 to 6 years old in newly set blocks or in trees set as replants in old blocks where the disease was not found occurring in the older trees.

This fact, together with the distribution of the disease in these plantings, definitely indicates that the trees were carrying the disease when purchased from the nursery. A number of growers who had such a high incidence of rusty mottle in their young trees stated that their planting-stock had been purchased from a nursery at American Fork. Two of the trees from which a large amount of budwood had been taken were located, but appeared free from the disease. Another one was said to have died last year. Some of the trees sold these particular growers were said to have been bought from a nursery in Oregon to fill orders. The worst case of apparent dissemination of nursery stock carrying rusty mottle occurred in one orchard at Mapleton, where 105 trees that had been set out 6 years ago in an old orchard were found to show more or less striking evidence of the disease and a few others apparently had died already from its effects and were cut off. None of the older trees in this orchard exhibited the disease. In an adjoining new planting a year younger only 4 trees out of 200 showed the disease.

In a few cases in Utah County orchards, rusty mottle occurred in trees about 15 years of age. In one such case a block of 6 rows of 16 Bing trees adjoined a similar block of Lambert trees, the planting having been made in 1928. Rusty mottle occurred more or less severely on 59 of the 89 original trees remaining in the Bing block. In the Lambert block this disease occurred on but 2 trees and, since these were at one end of the first row next to the Bing trees, it is possible that these also may have been of this variety rather than Lamberts. The fact that the disease was confined almost entirely to the Bing trees does not necessarily indicate that this variety is more susceptible than Lambert. In view of the frequency with which younger plantings in other orchards in Utah County show rusty mottle, the high incidence of this disease in the Bing block suggests that here again the majority of the trees of this particular variety already infected by the disease happened to be secured when they were purchased. An old block of Black Orb trees that adjoined this orchard on the west and was under the same ownership until last year showed no evidence of rusty mottle.

A similar instance of the introduction of the rusty mottle disease into an orchard by setting out trees apparently carrying the disease was observed in an orchard at Kaysville in Davis County. In this case nearly every tree in the southeast corner of a large orchard exhibited the disease whereas none in the balance of the orchard did. Of the 40 affected trees all had died back more or less seriously and were worthless from the standpoint of fruit production.

Rusty mottle also was found to occur on 16 trees in a 49-year old block of declining trees and on 2 trees in an adjoining 24-year-old block in an orchard in Spring Creek Canyon east of Springville, Utah County. While the 2 latter trees showed distinct evidence of being seriously affected by the disease, the 16 infected trees in the 49-year-old block did not appear any worse-looking than the general run of these trees, practically all of which were dying back more or less. Here again the trees showing the disease occurred mostly close together. The grower, who bought this orchard 24 years ago, claimed that he had observed the disease 8 or 10 years ago and that he had been advised by an agricultural official at that time to spray for its control.

In one of the younger plantings in Utah County showing rusty mottle, the disease was said to have been noted on 2 trees the first year. In other plantings 5 or 6 years old the growers stated that they did not notice anything wrong until a year or two ago. In cases where the disease was found to occur in trees about 15 years old the growers, strange to say, report that they first noted it from 3 to 5 years ago. However, the disease was found in other orchards where the grower apparently had not observed it at all, so that the observations of growers can not always be relied upon as indicating the number of years this disease has been present. In one or two orchards trees exhibiting rusty mottle were reported to have become severely defoliated last year, but no especially heavy defoliation was noticed this year.

In one large orchard between Farmington and Kaysville in Davis County, rusty mottle was inadvertently transmitted to a considerable number of trees in budding every third tree in every third row in part of the orchard for securing pollinizers, the budwood unfortunately having been taken from trees showing the disease. In both this and other orchards there is also striking evidence that the disease is being spread by natural means. In Davis County the disease appears to occur most frequently on Lambert trees, while in Utah County it appears to occur most frequently on Bings. It also has been observed on Royal Ann, Windsor, and an early black cherry, possibly Longstem Waterhouse. The evidence accumulated in this survey indicates that rusty mottle has occurred in Utah for at least 10 years and probably much longer.

Upon the suggestion of the county agent, in the belief that the disease now definitely known as rusty mottle was cherry leaf spot (Coccomyces), some growers in Utah County sprayed their trees with 5 lbs. of wettable sulfur and 1 gal. of liquid lime-sulfur to 100 gals. of water. Since this was done after the initial leaf-fall, the development of new growth by the trees later convinced the growers that they were getting beneficial results.

While it is claimed that rusty mottle can not be diagnosed to best advantage after fruit maturity, the writer had no difficulty in detecting it in most cases. Even on young trees the disease usually can be recognized at a distance in orchards where it occurs by the general appearance of the trees. Affected trees are characterized by a general sparseness of foliage on the lower portion of the crown and lack the deep green color of normal trees. In addition, there is frequently a somewhat roughened condition of the bark. Following the loss of leaves, the buds and fruit spurs die; as a result, affected trees soon exhibit a bare, rangy appearance, with the foliage best preserved on the terminal portions of the branches. The disease appears to affect some trees much more severely than others and it is

possible that there may be different strains of the virus causing it. In some cases affected trees have died back rapidly, while in others the progress of the disease is much slower. In the more severe forms the branches die back rapidly and declining trees develop a mass of sprouts from the base of the crown.

Even after the fruit has been harvested and considerable defoliation has already taken place, the yellowish chlorotic spots characteristic of the rusty mottle disease are quite often, though by no means always, readily apparent on some of the leaves of affected trees, accompanied by brown necrotic spots that develop in the leaf tissues. With increasing age these spots crack loose and tend to fall out, leaving a shot-hole effect. In many cases, however, the rusty chlorotic spots may not be especially apparent and the disease may be manifested chiefly by the occurrence of the necrotic spots in the leaves. In mild cases, where extensive defoliation and dying of the branches has not occurred, close observation is necessary to detect the disease. Leaf symptoms frequently are not apparent in vigorous sprout growth developed after trees have declined seriously from the disease. In a number of such trees in which symptoms were not particularly well expressed when mapped late in the summer, typical symptoms were found to be well expressed on a new flush of growth that developed on some of these trees in the fall. Moreover, in trees that exhibit an abundance of the characteristic symptoms of the disease a large proportion of the affected leaves may be blown off by high winds. The fact that the rusty chlorotic spots so characteristic of the disease frequently are not especially apparent does not necessarily jeopardize the diagnosis, since in affected orchards all gradations of leaf symptoms down to very slight necrotic spotting with none of the rusty chlorotic effect may occur on infected trees, both old and young. Instances of chlorotic spotting without the rusty chlorotic spots have been observed on young trees even before any evidence of defoliation or general abnormal condition of the tree becomes apparent. So consistently are these brown necrotic spots associated with the disease, however, that the presence of the typical rusty chlorotic spots does not appear absolutely essential to the diagnosis of the disease. Continued observations of this type of the disease are of course necessary to substantiate this, and the incidence of rusty mottle in a number of orchards has been plotted for further study.

Wilt. A chronic wilting and dying of sweet cherry trees, which Dr. Richards' experimental work at Bountiful indicates may be due to the western X-virus, has been found to be of widespread occurrence and very destructive in some orchards in Weber County, in several in Davis County, in 2 in Salt Lake County, and in a few in Utah County. This disease is most widespread in Davis County, where the western X-disease of peach also has been found to occur with the greatest frequency.

Unfortunately, this wilting does not always appear sufficiently distinctive from wilting caused by other agencies to diagnose it with certainty. In some cases where gophers have cut off roots of a tree a very similar type of wilting occurs. A similar wilting and dying may occur also where the roots of trees have been injured by excessive water in low situations, and even much more frequently in occasional orchards with inadequate irrigation to satisfy the moisture requirements of trees. A somewhat similar type of wilting and dying of trees also appears to occur in occasional orchards where crowngall is prevalent.

The fact remains, however, that in a number of orchards a very alarming amount of wilting and dying of fine bearing trees occurs under conditions where the trouble can not be attributed to deficits or excesses of water, nor to gophers or crowngall. In blocks of sweet cherries the repeated death of trees over a period of years has resulted in losses running as high as 50%. Trees developing this type of wilting frequently die within a few months but in some cases the progress of the disease may be retarded so that in the year following its appearance the tree may develop a sparse, small-leaved foliage and may not die until some months later. In the rapid type of wilt usually characterizing this disease the leaves become flaccid and droop and a large proportion scattered throughout the crown turn golden yellow before falling, as in drought injury. However, such senile leaves may be largely blown off prematurely by high winds. In the later stages of the disease the foliage remaining on the trees frequently wilts and dries up rapidly as death ensues. The disease often affects the branches first on one side, so that these wilt and die before the balance of the tree; such cases are readily distinguishable from drought injury, in which the wilting and yellowing of the leaves tends to occur rather uniformly throughout the trees, with the terminal portions dying first when the point of ultimate decline is approached. In other cases, however, the chronic wilt may involve the crown more uniformly, so that a knowledge of the local conditions is necessary in order to diagnose the trouble properly. While the disease is sometimes confined to localized areas in orchards it usually occurs more or less sporadically. Nothing is known in regard to the mode of spread of this disease but it progresses with great rapidity in some cases and constitutes a serious factor of loss in some orchards.

In one orchard at Holliday, Salt Lake County, where 4 trees on Mahaleb stock dying from this rapid form of wilt were pulled, it was observed that practically all the roots on each tree were dead and the bark around the root crown in each case was dead up to the bud union, but green above. In fact, it definitely appeared that the root system in each case must have died back seriously before the top began to wilt and decline. In this particular block of orchard all the trees that showed this wilt last year were removed, but a considerable number of new cases developed this year. It is only rarely, however, that growers are willing to pull trees before they have died, which is too late in this case for diagnostic purposes.

On October 4 the incidence of this chronic wilt was remapped in an orchard on Mahaleb stock at Bountiful, where several cases were found when it was first mapped on August 2. The remapping revealed a few new cases. In order to get a further idea of whether or not the wilting was preceded or accompanied by dying of the root systems, the hard, gravelly soil was dug away to a depth of 6 inches below the bud union so as to expose the root crown of 20 trees showing various stages of what appeared to be this type of wilt. In practically all cases the bud union occurred at or somewhat below the ground line. Ten of these trees showed definite areas of bark of varying extent around the root crown below the bud union, and in some cases also one or more lateral roots either virtually or completely dead. This is conclusive evidence that the root systems were already seriously affected. With one exception, these comprised trees that exhibited more or less pronounced wilting and decline on August 2. On 2 wilting trees that had died since then the bark below the bud union was completely dead; on one of them it was dead also above the bud union, while on the other it was dead only on one side above the bud union. In 7 other wilting

trees, mostly new cases since August 2, no evidence was seen of the dying of the bark around the root crown or on the lateral roots. In another tree the bud union was buried so deeply that the root crown was not uncovered. In all cases but the 2 trees that had died recently the bark above the bud union was still green. This superficial examination of the wilting trees in this orchard furnishes further evidence that, at least with trees on Mahaleb stock, the wilt and decline is preceded by or coincidental with the dying of the root systems and develops on the side of the tree where the roots first become seriously affected.

At North Ogden it was observed that in adjoining blocks of sweet cherry trees of about the same age the chronic wilt and decline of trees was prevalent in the block on Mahaleb stock, whereas not a single case occurred in the other on Mazzard stock. Moreover, so far as it was possible to ascertain, all the numerous cases of this serious disease that have been observed have been trees on Mahaleb stock. Further observations on the influence of the rootstock on the incidence of this disease are of course necessary before any definite conclusions can be drawn. The preliminary findings here reported on this wilt disease definitely emphasize the importance and necessity of investigating not only the rootstock with reference to the incidence of the disease but also the effect of the disease upon the root system of the Mahaleb stock in order to secure information of vital importance to the solution of this serious problem.

Miscellaneous Virus Diseases. Two trees with Raspleaf were found in one orchard at Bountiful, Davis County. Three additional cases of this virus disease were found in 2 orchards at Pleasant View, Weber County, 2 in one orchard occurring on large Black Tartarian trees.

A single tree with an as yet unidentified virus disease was found in an orchard at Holliday, Salt Lake County.

Laceleaf, suspected of being a virus disease, was found occasionally on trees in orchards in all 4 counties.

A few instances of various types of Chlorotic Spotting, apparently of virus origin, were found in other orchards as follows: one at Mapleton and one at Payson, Utah County, one in 2 different orchards at North Ogden Weber County, and 2 of a greenish-yellow chlorotic spot on Royal Duke trees in a nursery at Centerville, Davis County.

Budwood from all of the above trees, with the exception of those showing raspleaf and laceleaf, was collected and sent to Dr. B. L. Richards for propagation in his experimental plot at Bountiful.

Crinkle. This virus-like disease was found to occur rather generally throughout the 4 counties where the survey was made but, as a rule, was observed only on occasional trees in any one orchard. In Weber County this trouble was observed in 27 out of 46 orchards examined, being noted on 163 or 1.9%, of a total of 8612 bearing trees. In one of these orchards, where crinkle was prevalent to an unusual extent, it occurred on 39 out of 361 trees. In Davis County crinkle was observed in 14 out of 27 orchards examined, being noted on 56, or 0.8%, of a total of 7159 bearing trees. In one small orchard where it was most prevalent, it occurred on 15 out of 187 trees. In Salt Lake County crinkle was observed in 3 out of 9 orchards being noted on but 3, or but 0.2%, of a total of 1325 bearing trees. In Utah County it was observed in 13 out of 18 orchards examined, being noted on 82 trees, or 1.1%, out of a total of 7350, mostly bearing.

The extent to which crinkle occurs in trees is quite variable. In some instances it may occur only on a few leaves or on one or more small branches. In others it may occur throughout large limbs, with the foliage on other limbs remaining normal. In most cases, however, it occurs more or less generally throughout affected trees, giving them a very distinctive appearance. In one case where a tree had a divided trunk the entire growth on one trunk exhibited crinkle while that on the other was normal. Some evidence has been found to indicate that, though this trouble is most commonly transmitted by using budwood from affected trees, it frequently arises as a bud sport or mutation in trees that have been growing normally for a number of years.

Deep Suture. Deep suture was found to occur rather generally throughout the 4 counties where the survey was made, but, as a rule, was observed only on occasional trees in any one orchard. In Weber County this trouble was observed in 25 out of 46 orchards examined, being noted on 173, or 2.0%, of a total of 8612 bearing trees. In Davis County it was observed in 12 out of 27 orchards examined, being noted on 19 trees, or 0.3%, of a total of 7159 bearing ones. In Salt Lake County it was observed in 3 out of 9 orchards, being noted on but 3, or 0.2%, of a total of 1325 bearing trees examined. In Utah County it was observed in 8 out of 18 orchards, being noted on 26, or 0.3%, of a total of 7325 bearing trees. Unfortunately, from the standpoint of this trouble, the survey necessarily was made largely after the fruit had been harvested. In nearly all cases noted the diagnosis of the leaf symptoms was confirmed by examination of either fresh fruit on the trees or desiccated fruit that had fallen to the ground. The number of cases of deep suture undoubtedly would have been much higher had it been possible to make the survey earlier before the fruit was largely harvested. The fruit from deep suture trees may be more or less extensively affected and, where exhibiting this defect, is of no commercial value, and such trees usually are not picked. Thus, trees exhibiting deep suture result in a crop loss as long as they are retained and growers neither appear to remove or topwork them.

Powdery Mildew. Powdery mildew (Podosphaera oxyacanthae) was found occurring on leaves of young shoots of a number of trees of both sweet and sour cherries in the vicinity of Kaysville, Davis County. It was later found occurring sparingly on sweet cherry and on one of the Duke cherries at North Ogden, Weber County. This disease does not appear to be of any particular importance ordinarily in Utah cherry orchards.

Survey of Sweet Cherry Orchards in Washington County

A survey was made of the majority of the mostly small and widely scattered sweet cherry orchards in Washington County, Utah from October 30 to November 2, 1944. The sweet cherry has never been regarded as a particularly profitable crop in this county and there has been little demand for nursery trees to make newer plantings. Trees do not seem to set good crops of fruit with any degree of regularity and a large percentage of the fruit tends to be "twin" or "double". This trouble is much worse in some years than in others. In 1942 it was estimated that at least half, and perhaps from 2/3 to 3/4, of the fruit was rendered worthless. It is generally believed that the unusual prevalence of this trouble is occasioned

by the high temperatures that prevail in this part of the State. From a climatic standpoint, Washington County in the southwestern corner of Utah is more like Arizona or southern Nevada. This corner, owing to a great land-fault, is much lower in elevation than the balance of the State, the altitude being only about 2800 feet. The winters are very mild and the temperature rarely descends below 26° F. The growing season for the trees in Washington County averages about 2 months longer than in the main orchard sections farther north in the State, where the elevation averages around 4500-4800 feet. As a result, cherry trees in this county become as large in 15 years as they do in 20 or 25 in orchards farther north.

Orchards in Washington County consist mainly of peaches, with some sweet cherries, apples, and pears, and growers marketed about $400,000 worth of fruit during the past year. Fruit-growing there, however, is largely incidental to cattle-raising. Trees in most orchards are not especially well-cared-for and some are badly neglected. Aside from irrigation, little is done in many orchards except plant the trees and harvest the fruit. Little effort is made to keep trees headed back and, as a result, they tend to grow tall and rangy. In some orchards large erect limbs are cut off at picking time to expedite harvesting the fruit and reduce the height of the trees. In most orchards the trees were high-headed as a result of the common practice of grazing cattle in them, since growers feel that they have to utilize any pasture source for their cattle. In most of the cherry orchards visited the limbs had been more or less extensively barked by horses; in one orchard so badly that some trees were dying from girdling. In one orchard where cattle were being pastured no cultivation had been practiced for some years and parts of this orchard had grown up in thickets of bushes of Baccharis emoryi. Iron chlorosis, due to the highly alkaline reaction of the soil, was rather widespread, being quite severe in at least one orchard at Toquerville. In another orchard in this locality, where a hardpan formation occurred about 2 feet below the surface, one block that had become unprofitable was pulled out and the trees hauled off to an adjoining tract for use as firewood. All of these trees were found to have been planted much deeper than they should have been. While some were but 6 to 8 inches deeper than the lateral roots others ranged from 12 to 15 inches deeper, and this in a heavy, compact soil. When this grower was questioned as to the method of planting trees he stated that he just dug a deep hole and figured that by setting the roots deep they would be less inclined to dry out. This apparent widespread practice of setting trees too deeply no doubt exerts a marked retarding effect on their growth in subsequent years. In one of the remaining blocks on this same property the writer estimated that the larger trees were 15 years old and that smaller ones, which appeared to be younger, were about 8 years old. When the grower was interviewed later he stated that these trees had been planted at the same time and that all were 15 years old. At least 7 of the recently removed trees showed more or less extensive crowngall development at one side of the root crowns. The majority of the cherry plantings examined were on Mazzard stock, though in some orchards both this and Mahaleb stock occurred.

New Virus Disease. A disease apparently due to a virus, that, so far as can be ascertained, appears to be new and quite different from any other disease thus far seen in Utah, was found in 3 orchards at Leeds, 3 at Toquerville, and 1 at Hurricane, being observed on 122 out of 828

bearing trees in these 7 orchards. This disease was extremely prevalent in 2 rather neglected orchards at Leeds, occurring on 49 out of a total of 122 living trees in one, and on 40 out of 97 living trees in the other. In both of these orchards the trees were from 16 to 20 years old. In one well-cared-for orchard at Toquerville, where the disease appeared to be of much more recent origin, it was observed on 19 out of 182 bearing trees, but was confined entirely to one block of trees in this 2-block orchard. Unfortunately, it was too late in the season to attempt transmission experiments with budwood of this and other virus-like diseases that were observed in Washington County, but this will be done as early in the spring of 1945 as proves practicable.

The symptoms of this apparently new virus disease can be described only from trees seen late in the season. The disease apparently starts as a series of from one to several or many irregularly rounded, greenish-yellow, chlorotic spots at various points on the leaves, occasionally being marginal. When scattered, these usually range from 1/4 to 1/2 inch in diameter. When especially numerous the spots may become confluent so as to involve large areas of the leaf, or the entire leaf, and in such cases tend to remain comparatively small. When the spots are large and scattered, as is usually the case, an irregular, brownish zone or border develops around the periphery of each spot and a small, brown necrotic area usually occurs at the center. The conspicuous, irregular brownish borders make the spots stand out in very striking fashion, giving them a ring blotch effect. In some cases the entire spots become more or less completely involved in brown, necrotic areas. Affected leaves become senile and turn yellow and drop prematurely. The foliage on affected trees or limbs becomes yellow and drops much earlier in the fall on adjacent healthy trees. After the affected leaves turn yellow the brownish-bordered spots or blotches are greatly accentuated. The disease does not appear to have any effect in reducing the size of the leaves. In the early stages merely the lower leaves of the crown or those on one side of an affected tree may show the characteristic spotting. In some instances that appeared to be moderately early stages of the disease, one side or some limbs on the crown showed conspicuous leaf symptoms while the foliage on the remaining limbs appeared healthy. In more advanced cases, however, the disease develops more or less uniformly throughout the crown. By the time it advances to the point where the symptoms appear on the foliage throughout a large part of the crown there is considerable defoliation and the worst-affected limbs begin to die back from the ends. No roughening of the bark or bud-killing, as is characteristic in rusty mottle, was apparent. The disease is said to kill affected trees ultimately.

Nothing is known as to the origin of this disease or as to the length of time it has been present in Washington County. Its widespread occurrence in 2 orchards at Leeds indicates that it probably has been active there for at least 10 years. While further observations during the coming growing season, as well as inoculation experiments, are necessary to secure definite information in regard to the exact nature and behavior of this disease, it has the appearance of being of such pathogenic nature that it would probably constitute a serious menace to the large commercial cherry acreage in the more northern counties of Utah if it should become established therein.

Crinkle. Crinkle was present to an alarming extent in many of the orchards in Washington County, the incidence of this disease being vastly higher there than in sweet cherry orchards in Weber, Davis, Salt Lake, or Utah Counties, where it averaged 1.9, 0.8, 0.2, and 1.1%, respectively. In Washington County crinkle was observed in 21 out of 23 bearing orchards, occurring on 307, or 11.4%, of a total of 2708 bearing trees examined. A survey of 6 orchards in this county by Dr. B. L. Richards and Dr. A. L. Stark on April 30, 1943 showed crinkle occurring on 54, or 16.6%, of a total of 325 trees. In the main part of one orchard at Hurricane the writer found crinkle occurring on 115, or 36.5%, of 315 trees. In this and other orchards crinkle frequently occurred more or less throughout the crowns of large bearing trees. In others it was limited to from one to a number of branches and had the appearance of having developed comparatively recently as a bud sport after the trees had been growing normally for a number of years. In the orchard at Hurricane where the incidence of the disease was so appallingly high, one tree was noted where crinkle occurred on the foliage toward the ends of limbs and again farther back, with normal foliage in between. The reverse of this situation also was seen, where normal foliage occurred at the ends of limbs and again farther back, with typical crinkle foliage in between. In the same orchard one tree with the foliage severely crinkled throughout the crown had several small branches with normal foliage scattered through the interior of the crown. A very unusual case of crinkle development was observed at La Verkin on a tree with the trunk dividing into 2 main stems, one of which had been topped to reduce the height of the tree. The foliage on a whorl of branches that had developed about 27 inches below the point of topping, as well as that on another whorl about 3 feet below the first, showed severe crinkle, whereas all the foliage on the balance of the tree was normal. In a number of cases observed the breaking or cutting-back of branches appears to induce the development of this off-type foliage. In another orchard at La Verkin it was noted that of 77 Black Tartarian seedlings of various sizes that had come up spontaneously in groups in 3 rows of bearing trees, 18 showed crinkle and 10 others incised leaves, an abnormal type of foliage possibly related to crinkle.

While crinkle apparently may often develop spontaneously as a bud sport in trees that have been growing normally for several years, ample evidence has been secured to prove definitely that most of this trouble in orchards in various parts of Utah has resulted solely from dissemination by nurserymen, and occasionally growers, with budwood from affected trees. The experimental work of Dr. B. L. Richards has shown that when trees are budded with budwood taken from crinkle trees, the trouble is transmitted 100%. In a survey of orchards in Washington County made but a few days earlier last year Dr. Seth Barton Locke (PDR 27: 652-653. 1943) reported that in a nursery at Hurricane containing approximately 400 sweet cherry trees, 4.5% of them were found to be affected by crinkle. The writer, unaware of this report at the time, visited this same nursery with the idea of determining whether or not diseases were being transmitted through nursery practice. However, little was being grown other than peach trees. Only about 300 cherry trees, budded on Mahaleb stock early this year, were seen, and these showed no evidence of crinkle or other diseases. Neither was crinkle or any other disease apparent in one small 3-year-old planting at Leeds or in another about 4 years old at Hurricane.

Deep Suture. Deep suture also was found to be of widespread occurrence in Washington County, being observed in 17 out of 23 bearing orchards examined. However, since it was noted on but 58, or 0.2%, of a total of 2708 bearing trees, the incidence of this trouble is no higher than in orchards in most of the counties farther north in the State. Unfortunately, the survey was made too late in the season to afford accurate diagnosis of this trouble. One made when the fruit is on the trees undoubtedly will show a much higher incidence. Deep suture, like crinkle, is transmitted through use of budwood from affected trees. It appears to be related to crinkle and is usually found in orchards where crinkle occurs, though usually to a lesser extent in Utah.

Incised Leaf. An abnormal type of foliage, designated as incised leaf, was noted occurring on occasional trees in 11 out of 23 bearing orchards, occurring on but 22 out of 2708 bearing trees examined. This appears to be an off-type leaf condition related to crinkle. Affected leaves usually are smaller than normal leaves and are characterized by irregular and often deeply incised lobes along the margins. Sometimes there is also an abnormal forking of the lateral veins. This type of foliage does not appear to occur generally throughout the tree, as crinkle often does, but was noted chiefly on some of the leaves on the lower parts of the crowns. In one or two instances a trace of crinkle occurred on the same trees. As was noted under crinkle, this incised leaf condition was noted also on 10 out of 77 Black Tartarian seedlings of various sizes that had come up spontaneously in groups in 3 rows of bearing trees in one orchard at La Verkin. It was observed in 3 orchards at Leeds, 1 at Hurricane, 4 at La Verkin, 1 at Santa Clara, and 2 at Toquerville. It was noted in the orchard surveys made earlier in Weber, Davis, Salt Lake, and Utah Counties.

Miscellaneous Virus-Like Diseases. Two trees in an orchard near Toquerville were found to show a marked chlorotic condition on some of the foliage. Affected leaves showed more or less pronounced whitish areas of tissue between the lateral veins, usually scattered over the leaves, though sometimes involving areas of considerable size. In some instances irregular whitish streaks developed in various patterns throughout the leaves, suggesting a virus trouble. This type of chlorosis appears to be identical with that illustrated in Fig. 3A in "Some mosaic diseases of Prunus species" (Hilgardia 12 (10): 627. 1939), which is considered non-infectious and occasioned by unfavorable soil conditions.

One tree at Leeds was observed to have abundant irregular, pale-greenish chlorotic spots developed at various points in the leaves but lying between the lateral veins. This trouble occurred quite generally throughout the crown.

Laceleaf, presumed to be a virus disease, was observed on a single tree at Leeds.

Diseases and Other Injuries Observed on Various Fruit Crops

Fruit Tree Diseases in a Nursery. In one nursery at Centerville, Davis County, inspected jointly by Mr. Earle Hitchins of the State Department of Agriculture, Dr. B. L. Richards and Dr. A. L. Stark of the Utah Agricultural Experiment Station, and the writer, 5 cases of Western X-Disease were found at various points in a block of peach trees, several cases

of Deep Suture were found in a short row of Black Tartarian cherry trees, and 2 cases of an unidentified virus-like disease, characterized by greenish-yellow areas in the leaves, were found in a row of Royal Duke cherry trees. It appears that even a rigid system of inspection may not eliminate all trees with virus diseases since the incubation period of some may be sufficiently long so that symptoms may not develop until later.

Chlorosis of Woody Plants. Chlorosis of orchard trees and grapes, and also shade and ornamental trees, has been observed to be one of the most widespread and serious problems in Utah, where the soils are dominantly calcareous. In the orchard sections that have been visited from North Ogden south to Provo and other points in Utah County, numerous instances have been seen where trees are severely affected, with large numbers, and even entire blocks in places, declining seriously or remaining unproductive Practically every kind of fruit tree appears to be affected, but peach trees appear to be most frequently and seriously affected, with pears and cherries to a lesser extent, and apricots least generally.

The most prevalent deficiency or lack of availability of essential elements appears to be that of iron. Entire blocks of peach trees often become so chlorotic from lack of available iron that the trees appear golden yellow. A block of trees thus severely affected is so conspicuous that it can be seen readily among the surrounding orchards for at least a mile away. The tendency for blocks of peach trees to become chlorotic appears to be greatly accentuated in low situations where drainage is not so good, especially where the roots have become buried to a considerable depth by the washing in of soil over a period of years. Cherry trees may be similarly affected, though less generally, and in severe cases the leaves may become bleached to an ivory or whitish color.

Zinc deficiency, characterized by little leaf and rosette, occurs much less frequently on various fruit trees than iron deficiency. It appears to be most frequent on sweet cherry, occurring most commonly on granitic soils from Ogden south to Kaysville. A number of instances have been seen where corrective sprays with iron or zinc sulfate have been applied to fruit trees, or injections of iron phosphate were made in holes in the trunks, with marked beneficial results. However, the greening effect upon the foliage appears to be rather temporary in most cases.

Obscure Symptoms on Italian Prunes in Northern Utah. Italian prunes from North Ogden south to Provo and vicinity have been observed frequently to exhibit a marked unhealthy condition and a tendency to die at an early age and to be unprofitable commercially, though healthy productive trees occur in some orchards. While prunes usually are an incidental crop in occasional orchards, a considerable number of small plantings occur, especially in Utah County.

The trouble that appears to be most common and widespread is characterized by more or less numerous chlorotic spots, suggestive of a virus disease, in the leaves. The trees fail to make a vigorous growth and have a distinctly unhealthy appearance, with the leaves small and more or less pallid. The fruit begins to color prematurely, and a large proportion in some orchards was characterized by exudation of gum from one or more points as though it had been stung by an insect. The tissues of the fruit are occasionally characterized by an abnormal dark brownish color and internal degeneration into gum. Much of the fruit begins to wither on the trees or

falls prematurely, and in Utah County growers complained that half of their crop was already on the ground and they expected to have little left at maturity. A majority of the trees in some plantings in Utah County were adversely affected and some growers stated that they were on the verge of abandoning the growing of Italian prunes unless some solution for their trouble can be found soon. In some plantings, especially farther north in the State, the leaves were characterized by the occurrence of brown, necrotic, circular spots, and in one block at North Ogden a distinct crinkle effect was observed.

It is possible that one or more virus diseases occur, either alone or in conjunction with unfavorable cultural or growing conditions. No particular observation or study has been made of prune diseases in Utah but they certainly merit considerable attention.

A Virus-Like Condition of Raspberries. A number of plantings of raspberries in the vicinity of Orem, Utah County, were found to be more or less severely affected by a disease characterized by a stunting of the plants in which the leaves become small and yellow and more or less curled and the fruit aborts and dries up after blooming. The canes later die back from the ends and affected plants cease producing new canes and gradually die out. The disease was most prevalent and severe in plantings of Taylor, one of the newer varieties that is said to produce the largest and best type of fruit in this section of Utah. The disease was reported to have been noted first 3 years ago and to have become quite troublesome the last 2 years. Plantings of Latham and Newberg varieties did not appear to be much affected. In one property visited Taylor plants were dying out rapidly between Latham plants which were holding up well. The disease in the Taylor variety was said to be most troublesome in plantings where the original stock plants had come from Michigan. A younger planting from another source showed no evidence of the trouble. This trouble has the appearance of being a virus disease of the yellows type but further observations will be necessary to definitely confirm this. It is possible that the Taylor variety may not prove to be any more susceptible than other varieties and that it is simply a matter of obtaining disease-free stock to start with. The same trouble was later reported occurring in plantings of the Taylor variety at Garden City, Rich County. In this case also the plants were reported to have come from Michigan.

Storm Damage to Crops in Utah. A gale, accompanied by a small amount of rain, swept from Salt Lake City to northern Utah early on the morning of July 20, reaching a maximum velocity of 50 miles an hour near Ogden. This was said to have been the worst storm in this part of the state in 6 years. Although crop damage was minor in the vicinity of Salt Lake City, farmers at North Ogden estimated that 50% of the apricot and cherry crops remaining unharvested was blown off. At Hill Field, south of Ogden, serious damage was done to apricot, cherry, peach and pear orchards. Considerable defoliation and wind-whipping of foliage occurred at several places. At Logan, in northern Cache County, considerable damage occurred in wheat, barley and oat crops.

EMERGENCY PLANT DISEASE PREVENTION PROJECT.

NUT DISEASES IN OREGON IN 1944

P. W. Miller

Persian Walnut Diseases.

Walnut Blight (Xanthomonas juglandis (Pierce) Dows.) was widely distributed in Oregon in 1944 but it was not so destructive as in 1942 or 1943. It is estimated that, on the average, 20% of the potential walnut crop in non-sprayed orchards in the State was destroyed or the quality adversely affected by this disease.

Ringspot (Ascochyta juglandis Boltsh.) was found on the foliage of Persian walnuts in a number of widely distributed orchards in Oregon. However, it was of no economic importance since only an occasional leaf on a tree was diseased and the lesions were not sufficiently abundant to cause any significant decrease in the functional leaf area.

Downy Spot (Microstroma juglandis (Bereng.) Sacc.) was found in a few orchards in the Willamette Valley. However, it was of no economic importance as it did not cause defoliation or decrease the functional leaf area to any significant extent.

Leaf Scorch (non-parasitic). This disorder was widely prevalent in Oregon in 1944, occurring to a greater or less extent in practically every Persian walnut orchard in the State. In some orchards on certain soil types it was of considerable economic importance as it caused a significant decrease in the functional leaf area from death of the affected spots and premature defoliation. It is noteworthy that in a number of orchards applications of borax to the soil appreciably decreased the incidence of this disorder.

Die-back (non-parasitic). A "die-back" of terminal shoots occurred in a number of Persian walnut orchards scattered throughout the State. The incidence of this non-parasitic disorder was reduced in certain orchards by applications of borax to the soil.

"Black-Line" (Girdle) of Grafted Walnuts. This disorder was the cause of the death of a number of grafted walnut trees ranging from 12 to 22 years of age. All of the affected trees were of the Franquette variety grafted either on California black walnut (Juglans hindsii Jepson) rootstocks or on hybrids of other species with J. hindsii.

Filbert Diseases.

Bacterial Blight (Xanthomonas corylina (P.W. Miller et al.) Dows.) was widely distributed in Oregon in 1944, occurring in varying amounts in both young and old orchards in all parts of the State. In general, however, it was not so prevalent nor so severe as in 1942 or 1943.

Mildew (Phyllactinia corylea Pers. ex Karst.) occurred in limited amounts in a number of orchards in the Willamette Valley. It was of no economic importance, however, as the disease did not make its appearance until very late in the season. The infected leaves retained their normal green color until the end of the season and persisted on the trees until the time of normal leaf fall.

Leaf Scald (non-parasitic). This disorder was widespread and exceptionally severe in Oregon in 1944, occurring in practically all filbert orchards in the State. Its prevalence was associated with the occurrence of abnormally high temperatures during the latter part of August. The trouble was worse in orchards located on relatively shallow soils with limited reserve

of moisture and fertility. Under such conditions, the disorder caused appreciable economic damage as it resulted in a significant reduction in the functional leaf area from the death of the affected parts and premature defoliation.

Brown-Stain (non-parasitic). A trace of this disorder was present in a limited number of orchards in the Willamette Valley.

Filbert Shrivel ("Blanks") (non-parasitic). This disorder of the nuts, which is characterized by a failure of the embryo to develop, was widely prevalent in Oregon in 1944, occurring in greater or less amounts in practically every orchard in the State. It is estimated that, on the average, the loss from this disorder will approximate 5% of the potential filbert crop.

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES

OLIVE KNOT SURVEY IN CALIFORNIA

Henry Schneider and E.W. Bodine

On December 6, in company with Dr. E. E. Wilson of the Division of Plant Pathology, University of California, and Mr. Henry Everett, Farm Advisor, Butte County, olive orchards were inspected for olive knot (Phytomonas [Agrobacterium] savastanoi).

Table 1. Occurrence of Olive Knot in Butte and Tehama Counties, California

Number of orchards		Number of trees											Types of fruit*	Condition of orchard
		Affected by old knots			Affected by new knots			With only new knots evident			Diseased	Healthy		
Inspected	Infected	Se	M	Sl	Se	M	Sl	Se	M	Sl				
Butte County														
Oroville														
8	2	5	12	16	4	9	20	--	--	3	36	236	Mostly small, few large	Good to excellent
Wyandotte														
3	2	--	--	3	--	--	2	--	--	--	3	217	Small	"
Bangor														
3	--	--	--	--	--	--	--	--	--	--	0	109	Mostly small	"
Honcut and Palermo														
8	5	34	32	41	9	21	67	--	--	9	116	212	Equal amounts large and small	Poor to good
Tehama County														
Corning and Richfield														
14	12	93	33	39	20	43	93	--	--	--	165	147	"	Fair to good

Se -- Severely affected, knots every few inches on branches of half to all of the tree

M -- Moderately affected, knots every 2 or 3 feet on main branches and more frequently on leafy branches in some parts of the tree

Sl -- Slightly affected, knots rare

* -- The Mission variety, small-fruit type, is known to be moderately resistant.

From December 7 to 9, inclusive, another survey was made to determine the prevalence of recent olive knot infections in the olive-growing districts in Butte and Tehama Counties.

Occurrence in these two counties as determined during these surveys is summarized in Table 1.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

SHORTER NOTES ON DISEASES OF FRUIT AND NUT CROPS

Reports are of Emergency Plant Disease Prevention Project surveys.

FIREBLIGHT ON PEARS IN CALIFORNIA: As a result of a report of a fast-running fireblight (Erwinia amylovora) of pears near Placerville in Eldorado County, a survey was made in Eldorado and Placer Counties and in the Delta area of Sacramento and Contra Costa Counties, during the period December 10 to 16. In one orchard near Placerville occasional late blossoms on long succulent shoots became infected in the autumn. Such twigs turned black for about 6 inches below the blossoms. When pruning, about December 1, the grower noted that the disease was active in wood several years old. It apparently ran down the branches from the late blossom infections. The trees were quite succulent.

No other case of late blossom infection was observed in the area surveye Occasional blighted twigs and branches resulting from spring infections were found in Eldorado and in Placer Counties. Old blight infections were severe in one orchard near Loomis. The margins of cankers were sharp and there was no indication of recent activity except in the one orchard near Placerville. In the Delta area blight infections were rare. -- Henry Schneider

Several small plantings of pears observed in Stanislaus County were severely affected by fireblight. -- E. W. Bodine, week ending Dec. 16.

FIREBLIGHT AND BLAST IN CALIFORNIA APPLE ORCHARDS: Many small twigs were killed by Fireblight in trees of one uncared-for orchard in Sonoma County. -- Henry Schneider, Nov. 26-Dec. 2.

A considerable amount of Blast (Pseudomonas syringae) was observed in one young apple orchard in the vicinity of Watsonville in Santa Cruz County. -- E. W. Bodine, week ending Dec. 16.

CITRUS DISEASES IN LOUISIANA: In an earlier report (PDR 28 (37): 1119, Nov. 15) it was noted that a fungus tentatively identified as Xylaria polymorpha was associated with a root rot of trifoliate orange (Citrus trifoliata) stocks of Satsuma and other orange trees in the Buras-Triumph area. The fruiting structures were attached to the trees at the base of the trunk. Since then additional fruiting structures have been found, on diseased stocks only. In two instances they were attached to dead roots 1 to 4 feet from the trees.

A considerable amount of Louisiana Sweet and Navel oranges was observe on the ground. Most of the fruits examined were affected by a stem-end of undetermined cause. Apparently there will be a considerable loss fro this trouble. -- Douglas C. Bain, Dec. 4-16.

DISEASES OF NUT TREES IN CALIFORNIA: In company with Dr. Harvey E. Thomas, Pathologist of the University of California, a survey was made in several counties in central California.

Blackheart (Verticillium albo-atrum) was observed in a few almond trees in the vicinity of Le Grand in Merced County. The disease appeared to be quite prevalent in another almond planting near Los Banos in the same county.

Root rot (Armillaria mellea) had killed all of the trees in an area of approximately one acre in one almond orchard near Le Grand.

Mistletoe (Phoradendron sp.) was commonly seen on black walnut and occasionaly on Persian walnut and on almond.

Crown rot caused by Phytophthora cactorum was found in a few walnut trees in Contra Costa County.

Girdle or black-line, probably due to incompatibility at the graft unions, was also noted in a few walnut trees. -- E. W. Bodine, week ending Dec. 16.

DYING OF ELMS IN ILLINOIS

J. C. Carter

Reports have already been made, in varying detail, regarding the dying of elm trees in 1944 in midwestern States other than Illinois. The present report on the Illinois situation is made for the purpose of giving a more complete general picture of the 1944 outbreak.

At intervals during the past 14 years, numbers of elms have died in and near large and small cities, notably Hillsboro, Danville, Peoria, Quincy, and Cairo. But it was not until 1944 that dying of elms became general over a wide territory within Illinois.

Our observations have shown that this dying, so far, has been confined to the southern two-thirds of the State. Although dead and dying trees have been seen almost throughout this region, the greatest number of affected trees has been found within a broad belt extending diagonally southwestward from Danville and Paris on the east to Alton and Belleville on the west. The localities in which dying elms have been found and the numbers of diseased trees seen in each locality from 1939 to 1944 are given in Table 1. The list includes 49 places located in 24 counties. In 1944, 1653 affected trees were observed, while only 188 such trees had been recorded from 1939 to 1943. However, the relatively small number of affected trees recorded before 1944, in most of these places, may have resulted partially from limited observations.

The distribution of affected elms as observed in 1944 is shown on the map, Figure 1. As the map shows, there are two large areas, each including several counties, within which there is no record of elms dying in 1944. One of these areas includes the 28 counties making up the southern quarter of the state; the other area is the central western part of the state, including Hancock, McDonough, Fulton, Adams, Schuyler, Mason, Brown, Cass, Menard, Pike, Scott, Morgan, Calhoun, Greene, Macoupin, and Jersey counties. In both of these areas, as Table 1 records, dying of trees has occurred in previous years.

Patch-grafting experiments to determine the presence of phloem necrosis in Illinois were started in 1939. Patches of bark from branches of affected elms in Danville were grafted on elms in our experimental nursery in

Table 1. - Number of dead and dying elms observed from 1939 to 1944, in Illinois. Localities are listed in descending order according to the number of affected trees seen.

Locality	County	Number of dead and dying elms observed						
		1939	1940	1941	1942	1943	1944	Total
Peoria	Peoria						700	700
Danville	Vermilion	37		1	2		327	367
Charleston	Coles		1				176	177
Shelbyville	Shelby			34		50	48	132
Mt. Pulaski	Logan						108	108
Greenville	Bond						37	37
Buffalo Hart	Sangamon						29	29
Paris	Edgar			2			27	29
Springfield	Sangamon			1			21	22
Quincy	Adams			17				17
Effingham	Effingham						16	16
Kansas	Edgar						16	16
Hillsboro	Montgomery						14	14
Taylorville	Christian						12	12
Litchfield	Montgomery						11	11
Alton	Madison						10	10
Carbondale	Jackson			10				10
Centralia	Marion			4			6	10
Funkhouser area	Effingham						10	10
Lincoln	Logan						10	10
Lake Fork	Logan						8	8
Edgewood	Effingham					2	5	7
Lake Springfield	Sangamon						7	7
Belleville	St. Clair						6	6
DuQuoin	Perry			4		2		6
Pana	Christian			2			4	6
Mattoon	Coles						5	5
Ogden	Champaign			4	1			5
Salem	Marion					2	3	5
Watson	Effingham						5	5
Alhambra	Madison						4	4
Edwardsville	Madison						4	4
Melvin	Ford						4	4
Nashville	Washington						4	4
Elkville	Jackson			3				3
St. Elmo	Fayette						3	3
St. Libory	St. Clair						3	3
Urbana	Champaign						3	3
Cairo	Alexander			2				2
Cornland	Logan						2	2
Mason	Effingham					2		2
Odin	Marion						2	2
Tamarca	Perry			2				2
Anna	Union			1				1
Champaign	Champaign						1	1
Farina	Fayette					1		1
Flora	Clay		1					1
Mulberry Grove	Bond						1	1
Sigle	Shelby						1	1
TOTAL		37	2	87	3	59	1653	1841

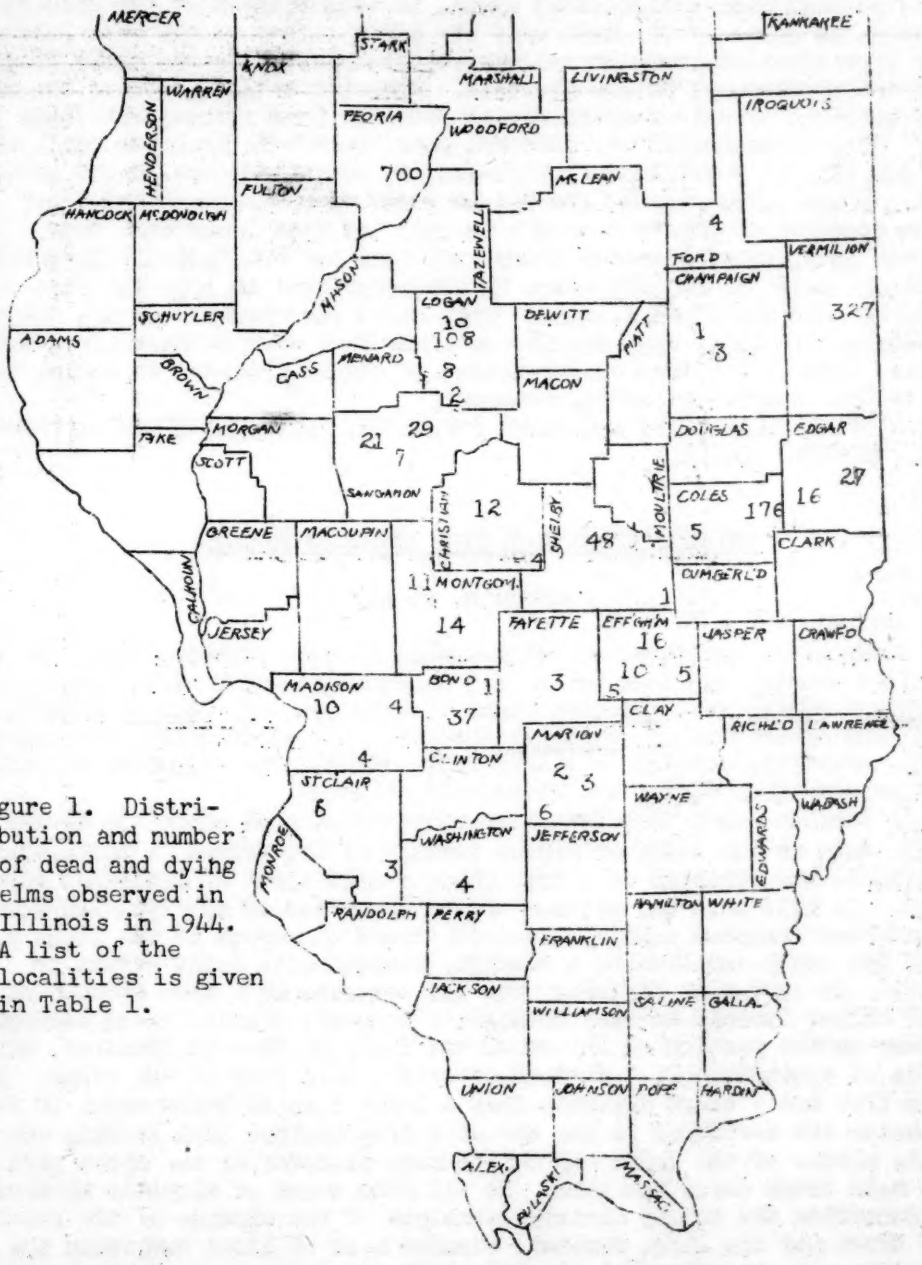

Figure 1. Distribution and number of dead and dying elms observed in Illinois in 1944. A list of the localities is given in Table 1.

1939 and 1940 and on potted elms in our greenhouse in 1941. Although most of the patches made satisfactory union, no transmission of the disease was obtained, in spite of the fact that the inner phloem of the bark patches taken from diseased trees showed the butterscotch color and brown flecking which are symptoms of phloem necrosis. However, transmission of the virus and production of phloem necrosis was obtained from patch-grafts made in 1942. This transmission was obtained when trunk bark from two small wild diseased elms in Danville was patch-grafted on potted elms in the greenhouse. These potted trees, grafted in 1942, showed foliage and inner phloem symptoms of phloem necrosis in 1943 and died later that year. Additional grafting of diseased trunk bark from the artificially infected greenhouse trees to healthy trees in the greenhouse in 1943 and 1944 successfully reproduced the disease. Most rapid reproduction of the disease was obtained in 1944, when greenhouse trees that were patch-grafted with diseased bark in May developed symptoms of phloem necrosis in August and died in late August and early September.

SECTION OF APPLIED BOTANY AND PLANT PATHOLOGY, ILLINOIS NATURAL HISTORY SURVEY, URBANA, ILLINOIS

WITCHES'-BROOMS OF PINE TREES IN FLORIDA

Arthur S. Rhoads

The occasional occurrence of witches'-brooms of a striking type, of undetermined origin, has been noted on 3 species of native pine, namely pond pine (Pinus rigida var. serotina Michx.), sand pine (P. clausa (Engelm.) Vasey), and slash pine (P. caribaea Morel.), at various points in central Florida, occurring chiefly on fairly large trees. The observations reported below were made during the first half of 1944.

In the various cases that have been observed on pond pines the brooms usually occur at the lower or median portion of the crown. A particularly fine example was observed on a tree about a mile north of Christmas (Orange County). In this case the witches'-broom consisted of numerous shortened, hypertrophied branches equally disposed around the trunk at the lower portion of the crown and forming a compact, rounded mass fully 8 feet in diameter. An even more striking case was observed in a tree about 6 miles east of Silver Springs (Marion County), a compact, rounded broom occupying the lower median portion of the crown and fully 10 feet in diameter, with a radius of approximately 6 feet on one side and 4 feet on the other. In another tree but a short distance away a large compact broom about 10 feet in diameter had developed on the end of a long upright limb growing out from the middle of the crown and of the same diameter as the upper part of the main trunk above the fork. In all such cases of gigantic witches'-broom formation the brooms clearly developed at the expense of the balance of the crown and the large compact, rounded mass of limbs composing the broom contrasts strongly with the thin foliage of the tops of the trees. A few additional but mostly less conspicuous instances of witches'-broom formation on pond pines were observed in crossing the Ocala National Forest and Game Refuge from a point east of the Ocklawaha River to about 2 1/2 miles west of the Marion-Lake County line. These mostly occurred radially disposed around the trunk but occasionally on the end of a limb. A few additional cases of witches'-broom formation also occurred on about a half-

dozen pond pine trees in an area of woods at Micanopy, 12 miles southeast of Gainesville, these trees having been observed in driving past at various times in former years.

Three additional instances of witches'-broom formation were observed on pond pine. Two of these occurred along the Chenay-Dixie Highway respectively 7 and 9 miles east of Orlando (Orange County), being observed on June 3. In one tree a broom about 3 1/2 feet across had developed around the upper median portion of the trunk. In the other a broom about 2 1/2 feet in diameter had developed on the end of a small limb a short distance from the trunk in the upper median portion. On the return journey to Gainesville on June 8 another and much more striking case of witches'-broom formation was seen on a pond pine tree between Micanopy and Payne's Prairie (Alachua County). In this case the broom started on one side of the trunk at a point 8 1/2 feet high and was composed chiefly of a series of long, radiating branches densely feathered with foliage and with a dense terminal growth. This giant type of broom had a lateral spread of about 16 feet, and the dense, compact growth contrasted vividly with the sparse foliage on the limbs of the thin crown above. This tree measured 16 inches D. B. H. and was estimated to be about 65 feet high.

Witches'-broom formation also was observed to occur on fully a dozen widely scattered sand pine trees in Marion and western Lake Counties in crossing the "Big Scrub" of the Ocala National Forest and Game Refuge from Lake Bryant Ranger Station east to Astor Park. On this tree, however, the brooms appeared to be confined chiefly to individual branches rather than whorled around the trunk, as was usual on pond pine. Only a single branch appears to become involved in the broom formation in any one tree, usually high up in the crown but occasionally on the lower limbs. The brooms develop into rounded, compact, densely-branched structures usually more or less spherical in outline, though sometimes flattened horizontally. They usually range from small brooms up to 2-3 feet in diameter. The limbs composing the brooms invariably are characterized by an abnormally dense growth of branches, with foliage and cones shorter than those borne on normal limbs of the same trees. The occurrence of these relatively small brooms has been noted also on sand pine trees between Cocoa and City Point (Brevard County) in former years.

In one fairly young sand pine near the eastern boundary of the Ocala National Forest, however, the main limbs coming out below the leader, which obviously had died several years ago, were found to have formed a gigantic witches'-broom-like structure comprising the greater part of the crown and much broader one way than the other because of crowding by adjacent normal trees. Most of the growth appears to have been concentrated in the limbs comprising this gigantic witches'-broom, the development of which appears to have suppressed and killed the leader. A somewhat similar case was observed in another fairly young sand pine about 12 feet high and 4 1/2 inches D. B. H., with normal lower limbs but with the entire top consisting of a large broom about 6 feet in diameter the broader way.

A case of gigantic witches'-broom formation on a slash pine about 2 feet in diameter in open, cut-over flatwoods on the west side of Cocoa (Brevard County) has been under observation for a number of years. In this case the broom originated about 30 inches from the trunk on a large limb in the lower portion of the crown about half way up the bole, and spread in all directions, forming a large, rounded, somewhat flattened, densely branched mass with a spread of about 20 feet, practically all on the south side of

the tree. The diameter of this limb was nearly as great as that of the trunk just above it. Another limb of equal diameter but normal structure grew out in the same directions about 3 feet higher.

The conclusion that at least the gigantic type of witches'-brooms here described develops at the expense of the balance of the tree is in complete agreement with the work of Tubeuf (Zeitschr. f. Pflanzenschutz 42 (5): 193-242. 1933), who studied these growths over a period of several years and illustrated some 60 instances. He considered that they must be regarded as dense, upward-growing branch systems parasitizing the normally branched host in the same way as mistletoe or Loranthus bushes. In witches'-brooms developing without apparent parasitic stimulus he found a marked tendency toward transmissibility of shape and slowness of growth to the progeny. The development, parasitic relationship, and transmissibility of witches'-brooms comprise a subject of considerable interest, but unfortunately, virtually disregarded in this country.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

ASPARAGUS RUST IN DELAWARE

A. J. Mix

At latest estimates (1940) about 1300 acres in Delaware were devoted to asparagus culture and the acreage has been gradually increasing. The crop is grown both for immediate market and for canneries. Production is centered in two areas, one the Dover-Camden-Wyoming area, the second around Bridgeville. The variety principally grown is Mary Washington, and since in recent years this variety has shown a significant amount of rust (Puccinia asparagi), Dr. T. F. Manns suggested that a rust-survey be undertaken.

Fields have been visited as occasion offered during the period November 13 to December 7. On November 13 a trip was made in the company of Dr. Manns, and on December 6 with Dr. J. W. Heuberger and with Mr. William I. Boyd, research horticulturist for Libby McNeill and Libby.

The amount of rust on individual plants was measured on an arbitary scale from 0 to IV inclusive, 0 representing no rust pustules, and IV "maximum" infection, i.e., the plants were covered with crowded rust-pustules (telial stage) and were evidently badly damaged. An unexpected advantage of making the survey late in the year developed, since the shoots of plants classified as IV were completely dead and gray in color, and stood out in sharp contrast to the yellow-brown, more lightly rusted plants. No estimate as to the effect of rust on yield can be made but it is apparent that plants graded IV must have been damaged sufficiently to cause reduction in next year's yield. (Actually the grade 0 was not used, it being difficult to find plants absolutely rust-free.)

The damage to the fields was listed as Light (most of the plants showing rust of grade I and II, about 10% showing III, and from none to 1 or 2% showing IV); as Moderate (most of the plants showing II and III with 15 to 20% I, and 5 to 10% IV); and Severe (25 to 30% IV).

Of 18 fields examined in the Camden-Wyoming area 6 were classified as Light, 4 as Moderate, and 8 Severe. In the Bridgeville area, of 9 fields seen, 6 were listed as Light, 3 as Moderate, none as Severe. (The Bridgeville fields are large; one field contains 80 acres). An isolated field

near Williamsburg, Maryland, was called Light.

Seed for all but one of the Bridgeville fields had been obtained from a local grower who has selected his seed from vigorous fields in the area. Seed for the oldest field (11 years from setting) had been obtained from New Jersey. This field was listed as Light.

Seed for some of the Camden-Wyoming fields had been obtained locally, but nothing is known of its source. Other fields were from the same source as the Bridgeville fields, and a number classified as Light, including the best field seen, were from seed furnished by a Maryland grower who has given care to the selection of individual plants in saving his seed.

It remains to be determined whether asparagus rust in Delaware is increasing from year to year. If, as appears, the variety Mary Washington is "losing rust-resistance" a new race of rust may of course be postulated, but it also seems possible that the variety itself may have changed somewhat due to continued cross pollination. Incidentally some observations made by Mr. Boyd indicate that the local Mary Washington is still more rust-resistant than other commercial varieties, notably the Paradise variety.

Fields examined were of all ages from 1 year from setting up to 11. Excluding the 1-year-old fields no correlation was found between age of field and amount of rust. One 19-year-old field was seen of the Martha Washington variety. This field has been abandoned and was not cut this year, but has yielded well throughout its life. It was examined twice, the second time in company with Dr. Heuberger, and no rust was found. Dr. Manns has seen the field several times during the past season and says he has seen no rust.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

E YELLOW-TOP OF TOMATO

George E. Altstatt and S. S. Ivanoff

In the Plant Disease Reporter (22 (1): 6-11, 1938) Young, Harrison, and Altstatt reported the incidence of an abnormality in tomatoes in Southwest Texas designated as "yellow-top". Harrison and Ivanoff (PDR 26 (2): 46-49, 1942) reported the occurrence of the same trouble in the fall crop of 1941. The trouble has been observed every fall season since then, occurring in amounts from a trace to about 3% in scattered fields, but in the fall of 1943, one field near Mercedes, Texas, had about 90% of the plants affected. Recent surveys in the Winter Garden area and in the Lower Rio Grande Valley have disclosed traces of yellow-top in a number of fields. Since the trouble is becoming of increasing economic importance, a detailed description of the symptoms appears desirable. The symptoms as recorded from observations of numerous mature tomato plants are as follows:

Foliage and Stem Symptoms. The general appearance of the plant gives the impression of lack of nutrients. The most recently developed young shoots and leaflets are completely devoid of chlorophyll, and are mostly bright yellow, but in some cases almost white. The affected shoots most often appear from the upper portions of the plant, and are erect, being easily detected from some distance. In some instances, small, tan-brown necrotic areas develop in the chlorotic leaflets. Flower buds are also yellow and many abscis. Discolored or necrotic areas with an occasional small

cavity are frequently found within the young branches and stems.

The older portion of the plant appears normal, is of good green color, and has normal appearing fruits. Some of the older leaves may show bluish veins. There is no stunting, and no proliferation. Because of lack of proliferation of shoots the abnormality appears distinct from the ordinary aster yellows.

Fruit Symptoms. Fruits on affected portions of the plant often show brown necrotic spots on the scar at the stem end. The flesh of the fruit is hard and woody and frequently a discoloration within the fruit is found.

The cause of the disease is undetermined, but appears to be of virus nature. Poor nutrition due to soil conditions may be eliminated as a cause of the trouble, since a single affected plant may be found between normal plants in the row.

EMERGENCY PLANT DISEASE PREVENTION PROJECT, AND
TEXAS AGRICULTURAL EXPERIMENT STATION, SUBSTATION No. 19, WINTER HAVEN

DISEASES ON GREENHOUSE-GROWN LETTUCE

Reports are of Emergency Plant Disease Prevention Project surveys.

INDIANA: During the week ending December 9, 1944, a survey for plant diseases in greenhouses in northern Indiana was made by Dr. C. T. Gregory, extension pathologist of the Purdue Agricultural Experiment Station, and the writer.

Grand Rapids lettuce (Washington strain) being grown for the commercial market in greenhouses at Elkhart, Indiana was practically free from tipburn (physiological). Mosaic (virus) was present to the extent of 5% in some beds and as a trace in others. An occasional plant was noted with Aster Yellows (virus). In one large commercial house, drop (Sclerotinia sclerotiorum) was causing the death of approximately 1% of the plants. In older lettuce (nearly ready for cutting for market), drop was responsible for losses as high as 10%. It was expected the loss from this disease might be higher unless cutting, which was handicapped by a man-power shortage, could progress at a faster rate. Chloropicrin had been used to control nematodes but was not sufficient to kill the sclerotia. Dr. C. T. Gregory, Purdue extension pathologist, who accompanied the writer, therefore made other recommendations. -- J. S. Tidd.

MISSOURI: Accompanied by Dr. C. M. Tucker of the University of Missouri, a survey was made on December 21 and 22 of greenhouses devoted to vegetable culture in the Kansas City area and at St. Joseph, Missouri. All the ranges visited were planted to leaf lettuce.

In the Kansas City area a number of ranges have experienced increasing difficulty during the past few seasons in producing uniform crops of lettuce and tomatoes. This was at first attributed by the growers to various factors, such as the quality of the seed used, prevailing weather conditions, etc. However, an analysis made by the Soils Department of the University of Missouri of representative samples of soils taken from certain of these greenhouses, has revealed the presence of an excess of soluble salts in these soils. This accumulation of salts has apparently built up gradually over a period of years as a result of repeated applications of commercial fertilizers, in the absence of thorough soil leaching, until

a condition of toxicity now prevails in certain ranges. Lettuce plants in such affected houses showed a lack of uniformity in development. Many plants were decidedly dwarfed and "off color". A necrosis of the fibrous roots of many of the affected plants was observed and in some instances there was an accompanying marginal browning of the foliage, as well as the development of many necrotic spots in the leaf tissues between veins. Microscopic examination of the affected tissues failed to reveal the presence of any microorganism, indicating that in all probability soil toxicity was the primary cause of this disturbance. Lettuce "drop" (Sclerotinia sclerotiorum) and gray mold rot (Botrytis sp.) were also observed. The former appeared to be limited to restricted areas and was causing only minor damage. According to the growers it has not been a menace to lettuce production since the practice of soil pasteurization was introduced some years ago. Gray mold rot was likewise of little importance. It appeared to be most damaging in the seed beds and on young transplants. It is recognized by most of the growers, however, as a potentially destructive disease, particularly when conditions of high humidity and relatively low temperatures prevail.

At St. Joseph the lettuce was making satisfactory growth. Gray mold rot appeared to be the only disease present and it was responsible for only minor damage, chiefly to young transplants. -- T. W. Bretz.

KERNEL SMUT AND WEAKNECK ON SORGHUM IN KANSAS

C. M. Slagg

Kernel smut. Surveys to determine the prevalence and severity of the kernel smut disease (Sphacelotheca sorghi) of grain sorghum were continued during the first and fourth weeks of November. The first reports on kernel smut were made in October, and the data from all field inspections to date have been condensed in the table following. It may be noted that this table covers inspections and counts made in 233 fields in 27 central and western counties. The sorghums examined included kafir, milo, feterita, and their various hybrids. Data on milo and milo derivatives were taken separately, but the other grain sorghums were not differentiated. Of the 55 milo type fields examined, 25 showed from a trace (less than 0.5%) to 46% loss from kernel smut, with an average loss for all milo fields seen of 3.8%. Of the remaining 178 fields of kafir, feterita and various hybrids, 90 showed losses from 0.5 to 85% with an average loss in the 178 fields of 8%. The average loss in the 233 fields examined of all types of grain sorghum, was approximately 7.0%. On the basis of a 34 million bushel crop, it may be seen that kernel smut alone caused a loss of more than 2,300,000 bushels in 1944.

The kernel smut data are shown by counties in the following table:

Kernel Smut of Grain Sorghums in Kansas 1944

County	Number of fields inspected	Number of Smutted fields	Average percent loss from Kernel Smut - (All fields)
Barton	9	4	12.9
Edwards	4	3	20.5
Ellis	9	4	4.1
Ellsworth	18	8	3.5
Ford	3	2	30.3
Graham	22	15	6.4
Kingman	4	1	3.8
Kiowa	8	0	0.0
Lincoln	16	4	2.0
Mitchell	14	8	2.5
Norton	16	13	5.7
Ottawa	7	1	0.1
Pawnee	4	2	10.3
Phillips	14	9	10.3
Pratt	6	0	0.0
Rice	2	0	0.0
Rooks	17	13	18.1
Rush	8	5	13.9
Russell	15	9	7.6
Saline	11	5	14.5
Sedgwick	2	2	2.0
Trego	8	7	4.8
Dickinson 4, Geary 3, Pottawatomie 3, Riley 4, Shawnee 2	16	0	0.0
Totals and average for State so far as surveyed.	233	115	7.0

Weakneck. This physiological weakness was seen in 6 of the 55 milo fields examined, with estimated losses in these fields of from 2 to 16%, and an estimated loss for all milo fields seen of approximately 1%.
EMERGENCY PLANT DISEASE PREVENTION PROJECT